the advantage of precisely simultaneous measures is a point of considerable importance when one of the stars is at a low altitude which is rapidly varying.

DISCOVERY OF MINOR PLANETS.—Four new minor planets were discovered in less than a week by Herr Palisa at the Vienna Observatory—Nos. 254 and 255 on March 31, No. 256 on April 3, and No. 257 on April 5. All are about the thirteenth magnitude.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1886 *APRIL* 18-24

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on April 18

Sun rises, 5h. 0m.; souths, 11h. 59m. 16·8s.; sets, 18h. 59m.; decl. on meridian, 10° 54′ N.: Sidereal Time at Sunset, 8h. 46m.

Moon (Full) rises, 18h. 58m.; souths, 0h. 24m.*; sets, 5h. 42m.*; decl. on meridian, 9° 13′ S.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury	4 34	11 4	17 34	5 11 N.
Venus	3 36	9 9	14 42	6 5 S.
Mars	13 43	20 47	3 51*	11 42 N.
Jupiter	15 51	22 7	4 23*	2 19 N.
Saturn	8 16	16 28	0 40*	22 51 N.

* Indicates that the southing or setting is that of the following morning.

Occultation of Star by the Moon (visible at Greenwich)

April	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
18	κ Virginis	4½	21 5	21 48	349 273

April	h.	
18	6	Mars stationary.
21	14	Mercury stationary.

Places of Comet Fabry.

1886	R.A. h. m. s.	Decl. ° ′	Log Δ	Brightness.
April 18	0 13 47	37 53 N.	9·628	145
22	0 58 58	33 58	9·504	230

Places of Comet Barnard.

1886	R.A. h. m. s.	Decl. ° ′	Log Δ	Brightness.
April 18	1 43 58	37 41 N.	0·109	37
22	1 41 36	39 2	0·075	54

The comet places are for Berlin midnight.

Variable-Stars

Star	R.A. h. m.	Decl. ° ′		h. m.	
S Cancri	8 37·4	19 27 N.	Apr. 23,	23 41	*m*
R Leonis	9 41·4	11 57 N.	,, 23,		*m*
U Virginis	12 45·3	6 10 N.	,, 24,		*M*
W Virginis	13 20·2	2 47 S.	,, 18,	0 0	*M*
δ Libræ	14 54·9	8 4 S.	,, 18,	3 52	*m*
U Coronæ	15 13·6	32 4 N.	,, 23,	4 10	*m*
S Libræ	15 14·9	19 59 S.	,, 22,		*m*
S Ophiuchi	16 27·7	16 55 S.	,, 19,		*M*
U Ophiuchi	17 10·8	1 20 N.	,, 18,	8 30	*m*
			and at intervals of	20 8	
X Sagittarii	17 40·4	27 47 S.	Apr. 21,	2 20	*m*
			,, 24,	0 0	*M*
δ Cephei	22 24·9	57 50 N.	,, 24,	0 0	*m*

M signifies maximum; *m* minimum.

Meteor Showers

The present week is one usually rich in meteors, but moonlight will interfere with observation this year. The most interesting shower, the *Lyrids*, radiant R.A. 274°, Decl. 34° N., April 18–20, has been poorly represented of late years. Several radiants from Cygnus and Draco are usually active from April 19 to April 23.

GEOGRAPHICAL NOTES

THE greater part of the contents of the current number of *Petermann's Mittheilungen* is devoted to the geography of the African continent. In the first paper (which is accompanied by an excellent map) Dr. Chavanne describes his journey from the Lower Congo to San Salvador and the Arthington Falls, as well as other explorations in Portuguese West Africa. The position of many hitherto unsettled points is now defined. The traveller states that he paid particular attention to the question of the population and its density. He counted the huts in the places through which he passed, and endeavoured to obtain from the natives details of the houses within 5 kilometres on each side of his route, and he comes to the conclusion that the estimates of some previous travellers are greatly exaggerated. Dr. Lenz communicates some observations on the Congo, and Prof. Kirchhoff writes a short but important article on the hydrography of the Muta Nsige. Dr. Karl Lechner gives the history and present condition of what he styles a "language island" in Moravia, a kind of oasis in this province of Slavs, in which the German, or a kind of German, language has been preserved by the people for centuries. The place is Wischau, not far off the high road between Brün and Olmütz. The people call themselves Schwoben, and in the struggle for the maintenance of their nationality they have been assisted by the Tyrol and Bavaria. Dr. Müller defends his edition of the Arabian geography of Hamdânî against the strictures of Herr Glaser in his recent account of his Arabian journeys.

THE *Verhandlungen* (Bd. xiii. No. 3) of the Geographical Society of Berlin contains an account by Lieut. Francois, of his journeys in the southern basin of the Congo. He accompanied the Wissmann Expedition to Kassai, and also Mr. Grenfell on his journey on the Lulongo and Chuapa, and he describes some of the incidents and observations of these journeys. Dr. Moritz, who proceeded to Syria in 1884, on behalf of the Archæological Institute of Berlin, read a paper on the geographical experiences of his journey. A brief communication from Dr. Sievers recounting his work in Columbia is also published.

THE Foreign Department of the Würtemberg Government has invited the Governments of Austria, Bavaria, Baden, and Switzerland to join in a common and simultaneous investigation of the depths of Lake Constance, and the preparation of a chart of it. The proposition is that a commission of specialists from all these States should meet at Friedrichshafen to settle the extent, methods, and time for the investigation. The Swiss Assembly has welcomed the proposal, more especially as the Swiss have already carried out a considerable part of the work as far as their portion of the trade is concerned.

SOME time since we noticed the success of two officers of the French navy, Capt. Réveillère and Lieut. Fesigny in a daring attempt to ascend the rapids of the Meikong when the river was in full flood. The Colonial Council of Cochin China has now passed a resolution affirming the necessity for organising a mission of engineers or naval officers to enter into a complete and minute study of the Meikong rapids at low water. These rapids are all that prevent access from the sea by the Meikong to Hung-Tseng, Luang-Prabang, and beyond even to Kiang-hung and the Shan States up to the Chinese border.

FURTHER details of Mr. Charles Winnecke's plan of that part of South Australia crossed by the overland telegraph, to which we have already referred, are supplied in a late issue of the *Colonies and India*. The survey shows that the distance from Tennant's Creek eastwards over the rivers Buchanan, Rankine, James, Herbert, and Milne, is 1626 miles. The country continually rises from Port Augustus till Burt Plain on the MacDonnell ranges—a distance of 1000 miles—is reached, after which it falls gradually to the boundary. Mr. Winnecke has included in his plan every camping-place along the telegraph line. He asserts that Lake Eyre is a considerable depth below the sea-level, a statement which he made in 1877, but which has been disputed. The highest point along the route was the Burt Plains in the MacDonnell ranges, which are 2532 feet above the sea-level, but the ranges themselves are several thousand feet higher. The telegraph station of Central Australia,

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Alice Springs, is 2000 feet above the level of the sea. The Finke River is described as the largest and most important in Central Australia; its southern part is now being re-explored by Mr. Lindsay. On the whole it appears that Mr. Winnecke's map and the details accompanying it add considerably to our knowledge of the geography of Central Australia.

THE last census of the Hawaiian Archipelago, as compared with that of 1878, gives some curious results. In these six years the pure natives have decreased from 44,088 to 40,014, while the half-castes have increased from 3420 to 4218. The Chinese immigrants in 1878 numbered only 5916; in 1884 they had increased threefold, their number being 17,931. In every other respect the population increased. The Portuguese labourers number 9377 against 436; immigrants from the United States were 2066 against 1276; British subjects 1282 against 883; Germans 1600 against 272, and so on. The children born in the archipelago of foreign parents increased from 947 in 1878 to 2040 in 1884. On the whole the population was 80,578 in the latter year, against 57,985 in the former, although the natives had diminished about 10 per cent. in the six years. We thus havd passing under our eyes the peaceful extinction of a race by the operation apparently of natural laws. The Hawaiians govern themselves under a sovereign of their own race, and under their native conditions; yet they are rapidly disappearing, simply through the presence of other races, without war or any other of the direct causes to which the decay of native races is generally attributed. The social conditions of the archipelago are an interesting study just now from many points of view.

M. VAN GEÛNS, Chief Engineer and Inspector of Public Works in Java, has lately been on a journey through that and the neighbouring islands, of which he has published an account. He speaks of the various Javan volcanoes, of which much has been heard lately, and says that since the eruption of Krakatão in 1883 the people live in comparative quiet. But this calm is only apparent, for volcanic eruptions, always numerous, are incessant. The volcanoes on the Island of Java itself manifest everywhere great activity, but not so as to produce a serious cataclysm. Smeroc, which is the highest mountain in the island, and its neighbours Brômo and Lamonyon, are active from time to time. In 1885, for example, Smeroc overwhelmed plantations and villages on its side with eruptive matter. Merapi, in the centre of the island, shows constant signs of life; lava is constantly flowing from it, smoke and steam are almost always visible at its summit, so that it is one of the active volcanes of the world. M. van Geûns reports another curious phenomenon. After a period of extreme drought continued rains have inundated one part of the country, while there is an absolute want of water in other places which should have it in abundance. This anomaly is attributed to the monsoons which blow irregularly, and which cause more anxiety to the Javanese than their volcanoes.

THE MINES COMMISSION REPORT

THE final report of the Accidents in Mines Commission has been issued as a Blue Book. The report, which occupies 120 pages, is accompanied by minutes of the evidence taken and numerous appendixes and diagrams. The report concludes with the following paragraphs, in which the Commissioners give a summary of the most important subjects dealt with and of the chief conclusions and recommendations based upon them:—

Volumes of air sufficient for the ventilation of even the most extensive collieries are capable of being passed through the workings by means of properly constructed furnaces, or by mechanical contrivances, such as are already in action at most of the collieries. At a large number of collieries the sectional area of the intake and return-air courses may be increased with advantage. Where furnaces are used they should by preference be in connection with dry and deep shafts, and should be provided with dumb drifts. Where mechanical contrivances are employed they should be in such positions and placed under such conditions as will tend to insure their being uninjured by an explosion, and, if they are not provided altogether in duplicate, there should be at least an engine in reserve. The improved system of ventilation by "splits" and the shortening of the air-courses, as practised in the larger collieries, is a subject of great importance, and we recommend that more general attention should be given to it. It would conduce greatly to safety if the system of carrying the intake air through two parallel drifts, of which one may be used as the travelling road, were introduced into workings likely to become extensive, and where mechanical haulage is intended to be employed.

That the casualties due to falls of the roof and sides are much more numerous than those due to any other causes is demonstrated by the tabular statement given at the commencement of this report. It is essential that all the officials and workmen in mines should pay special attention to the careful propping of the working places and travelling roads. In the north of England the system of trusting mainly to officials (deputies) for the timbering is found to answer well; in South Wales and other districts, where the roof, face, and sides are more liable to falls, the system of the men timbering their own working places has been found to be best.

We are of opinion, however, that in all cases the security of the working places should be examined into by over-lookers once at least in the course of each shift. Supervision has been greatly enlarged in the last thirty-five years, and we find that there is generally one official so employed to about twenty men, sometimes one even to eleven or twelve men. In order to reduce the number of casualties from falls, we recommend the observance of the following:—(*a*) The maintenance of ample supplies of timber in localities convenient to the workmen; (*b*) the proper training of each miner to the best modes of timbering and of otherwise protecting his working place; (*c*) the exercise of increased care on the part of the workmen in watching the roof, sides, and face, and protecting themselves in time; (*d*) the introduction, as far as possible, of arrangements with the workmen which will make it their interest not to avoid the labour of putting up the necessary timber, cog-walls, buildings, or nogs for their proper protection; (*e*) the employment of special timbermen or deputies for the timbering of main ways and also for the repairing as well as drawing of timber; (*f*) preventing timber being left in the goaf of long wall workings, which would have the effect of breaking the roof; (*g*) driving the working places as rapidly as possible by shifts of an ample number of workmen in each face, and so reducing the risk of falls and exposing the least number of men to danger at any one time.

We are of opinion that by improved discipline and the exercise of greater care by those employed in or travelling through engine planes and other roadways the number of casualties comprised under the head of "miscellaneous accidents" would be considerably diminished. The practice in some collieries in South Wales of boys running in front of the horses and trams should be prohibited. The very numerous casualties under the heads of "falls of roof and sides" and "miscellaneous accidents" are due in great part either to carelessness or want of early training. Looking to the importance of practical training, and of encouraging boys to enter the mines at the ages specified by the Mines Regulation Acts, we are of opinion that careful consideration should be given to this point in connection with the administration of the Elementary Education Act.

We think that the experiments we have made on the pressure of fire-damp in plugged bore holes in coal, a pressure sometimes amounting to upwards of 400 lbs. on the square-inch, have thrown much light upon the occurrence of sudden outbursts of gas. The boring of holes upward or downward has been successfully tried as a means of avoiding such outbursts, and we have little doubt that the closer attention which is now paid to thorough stowing and packing or building in the workings will contribute greatly to the same end. It is almost impossible to account for many of the accidents which have occurred in well-managed mines, some of which have originated in the main-intake airways, except upon the supposition that gas has suddenly invaded the workings from the adjacent strata. Sudden outbursts of large quantities of gas, accompanied by violent disruption of the floor, roof, or coal, are fortunately rare, but smaller incursions of gas, accompanied by falls of roof, or even without any apparent displacement of ground, are comparatively frequent. We are of opinion that in working fiery seams at great depth such abnormal discharges of gas must occasionally occur, yet that they may be successfully met by ample ventilation, good discipline, and efficient lamps. While we recognise that variations of atmospheric pressure exert an influence on the escape of gases which have accumulated in cavities, and possibly to a slight extent on that of gases emitted directly from the coal, we entertain great doubt as to the wisdom of placing reliance on the issue of meteorological warnings. These can at best only convey very imperfect information, which, moreover, may be sometimes dangerously misleading. We are of opinion that safety would be much more likely to be insured by unceasing vigilance on the part of the

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